been amended to require the ink to comprise "about 1-12% pigment and about 2-20% dispersant resin solublized by ammonium hydroxide." These two limitations were found in original claim 14, which was not rejected over these references. Hiraoka et al., Fuller et al., and Malhotra et al. each do not teach one or both of these limitations. Therefore, none of these three references anticipates claim 13.

The Examiner's rejection of claims 1-5 and 11 under 35 USC §103(a) over Sano et al. (US 5,324,349) in view of either Anton et al. (US 6,005,023) or Ma et al. (US 5,085,698), and Tsutsumi et al. (US 5,852,074) is obviated by amendment. The limitation of claim 8, which was not rejected over these references, has been added to claim 1.

The Examiner rejected claims 1-21 under 35 USC §103(a) over Fujimatsu et al. (US 5,913,971) in view of either Anton et al. (US 6,005,023) or Ma et al. (US 5,085,698), Tsutsumi et al. (US 5,852,074), Sano et al. (US 5,324,349), and either Lin et al. (US 5,531,818) or Nigam et al. (US 5,693,127). The Examiner states that "[t]he difference between Fujimatsu et al. and the present claimed invention is the requirement in the claims of ... (b) amount of anti-foaming agent ... and (d) conductivity of the ink." (Office Action dated December 8, 2000, page 4, 3rd paragraph).

The Examiner further states that "[w]ith respect to difference (b), Fujimatsu et al. disclose the use of anti-foaming agent, but do not explicitly disclose the amount in which the anti-foaming agent is used. Tsutsumi et al. ... disclose the use of 0.005-5% anti-foaming agent ...." (Office Action dated December 8, 2000, page 5, 3rd and 4th

paragraphs). Also, the Examiner states that "Tsutsumi et al. is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all of the features of the presently claimed invention." (Office Action dated July 2, 2002, page 6, 1st paragraph).

However, as stated in MPEP §2141.02, "[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." (emphasis in original). In this regard, Tsutsumi et al. states as follows:

> To improve the water resistance of the ink for inkjet printing, it has been proposed to use a pigment as the ink ....
> However, when a pigment is used as the ink, there might be caused a problem that the chroma of printed matters deteriorates, and the problem of nozzle clogging tends to occur. In addition, the improvement is not sufficient.
> ...
> The present inventors have carried out extensive research to solve the above-mentioned problems. As a result, it was found that when a vinyl polymer aqueous dispersion in which a hydrophobic dye is contained in particles is used as an ink base material, the water resistance of the ink can be improved without impairing color development properties of the dye.

(column 1, lines 35-44; column 1, line 64 - column 2, line 3). Thus, because Tsutsumi et al. teaches that a dye rather than a pigment should be used as the coloring agent, this reference teaches away from the present invention.

Moreover, as stated in MPEP §2145XD2, "[i]t is improper to combine references where the references teach away from their combination." In this regard, Fujimatsu et al. states as follows:

> As a conventional recording liquid for inkjet, there is often used a solution prepared by dissolving a water-soluble dye such as an acidic dye, a substantive dye or a basic dye in a mixture of a glycol-containing solvent and water .... The water-soluble dye is generally selected from dyes having high solubility in water for achieving the stability of the recording liquid, and as a result, there is a problem in that an inkjet recorded product is poor in water resistance so that a dye constituting a recorded portion easily bleeds when water is spilled thereon.
>
> For overcoming the above poor water resistance, attempts have been made to change the dye in structure or prepare a recording liquid having high basicity .... Further, attempts have been made to utilize a reaction between a recording sheet and a recording liquid to improve a recorded product in water resistance ....
>
> The above attempts are remarkably successful when certain kinds of recording sheets are used. However, an inkjet method uses recording sheets of various kinds, and a recording liquid containing a water-soluble dye achieves no sufficient water resistance of a recorded product in many cases.
>
> There is a recording liquid having good water resistance, obtained by dispersing or dissolving an oil-soluble dye in a solvent having a high boiling point or by dissolving an oil-soluble dye in a volatile solvent. However, these recording liquids are environmentally unacceptable in some cases due to the odor and discharge of the solvent, and the requirement to recover the solvent may be problem when a large volume of recording is conducted or a recording apparatus is placed in some place.
>
> For improving a recorded product in water resistance, therefore, it is under way to develop a recording liquid which is a dispersion of a pigment in an aqueous medium.

(column 1, lines 14-50).

Moreover, Anton et al. states that "dye-based inks are often unsuitable for use in applications requiring moisture resistance and greater light stability. The pigments are preferred colorants provided the pigment dispersion can be made resistant to flocculation and settling." (column 1, lines 25-29).

Furthermore, Ma et al. states as follows:

> The printed image produced by an ink jet printer, as in most printing processes, consists of discrete dots. While satisfactory for many applications, conventional dye based inks are not well suited for recording high quality images since the dye tends to wick in the paper fibers, causing the dots to have a feathered edge. Thus, the dots do not have the sharp boundaries needed to produce a high resolution image unless special paper is used. Also, the dyes tend to smear after the printing operation due to their high water solubility.
>
> Limitations of dye based inks are particularly apparent when it is desired to record a high quality, multi-colored image. Color selection is limited in that many of the readily available dyes lack color fastness (i.e., the dye tends to fade upon exposure to ultraviolet light) or do not have enough solubility to give the desired chroma. Moreover, the tendency of the printed dots to wick, or bleed together, is an aggravated problem because the printing of a high quality image depends on the formation of small, sharply defined dots of each printing color. While some of the problems associated with dye based inks may be overcome or alleviated to some extent by using special substrates, such as coated paper, there is a need for improved inks for ink jet printing.
>
> ...
>
> The present invention provides a pigmented aqueous ink particularly adapted to meet the demanding requirements of ink jet printers, the ink comprising an aqueous carrier medium and particles of pigment ....

(column 1, lines 20-44; column 2, lines 14-17).

Finally, Sano et al. states as follows:

> Dye-type ink compositions basically consisting of a dye and an aqueous medium have been known as inks for ink jet printing. It has been pointed out that images produced by the inks of this type are poor in both light resistance and water resistance because of the inherent properties of the dye. In order to solve this problem, inks prepared by using, instead of a dye, a pigment have been proposed.
>
> ...
>
> An object of the present invention is to provide a pigment-type ink composition for ink jet printing ....

(column 1, lines 11-18; column 2, lines 10 and 11).

Thus, Tsutsumi et al. teaches the use of a dye and teaches away from the use of a pigment, while Fujimatsu et al., Anton et al., Ma et al., and Sano et al. each teach the use of a pigment and teach away from the use of a dye. In other words, Tsutsumi et al. teaches away from each of Fujimatsu et al., Anton et al., Ma et al., and Sano et al., while Fujimatsu et al., Anton et al., Ma et al., and Sano et al. each teach away from Tsutsumi et al. Therefore, the Examiner's reliance upon Tsutsumi et al. is improper, and he has not presented a *prima facie* case of obviousness.

The Examiner goes on to state that "[w]ith regard to difference (d), there is no explicit disclosure in Fujimatsu et al. of the conductivity of the ink. Lin et al. ... disclose that inks typically possess conductivity of less than 7000 uS/cm in order to produce an ink that will not cause unwanted or premature heater damage, corrosion, ink instability,

or nozzle clogging (col. 12, lines 26-37)." (Office Action dated December 8, 2000, page 6, 1st and 2nd paragraphs).

However, the section of Linn et al. discussed by the Examiner actually states that "[t]he conductivity of the ink ***containing a small amount of pigment particles*** is preferred to be less than about 7000 MicroMho/cm ...." (column 12, lines 34-37) (emphasis added). Also, in column 1, 1st paragraph, Linn et al. teaches the use of "pigment particles ... present in the ink in an amount of less than 0.1 percent by weight," indicating that "a small amount" is "an amount less than 0.1 percent by weight." Furthermore, Nigam et al. states that "[c]onductivity may be imparted by the colouring agent when this includes a charged species." (column 2, lines 44 and 45).

The present claims require the ink to comprise "about 1-12% pigment," which is ***at least ten times*** the amount taught by Linn et al. There is absolutely no teaching in Linn et al. that ink containing the amount of pigment required by the present claims should have a conductivity of less than 7000 uS/cm. Moreover, based upon the teachings of Linn et al. and Nigam et al., if a charged pigment was used in the presently claimed ink, one would have expected its conductivity to be far greater than the conductivity disclosed in Linn et al.

Additionally, the Examiner states that "[a]lternatively, Nigam et al. ... disclose that inks typically possess conductivity of 2000-3000 uS/cm or higher in order that the ink has sufficient conductivity for ink jet printing (col. 4, lines 52-63)." However, the section

of Nigam et al. discussed by the Examiner actually states that "the ink compositions ***of the present invention*** exhibit the following characteristics for use in ink jet applications: ... a conductivity of at least 700 e.g. 700 to 2000 or 3000 or higher microSeimens/cm (us/cm)." (emphasis added).

In fact, the ink compositions of Nigan et al. each contain a dye rather than a pigment. Inks containing pigments have different characteristics than inks containing dyes, and a conductivity that is optimal for a dye-based ink is not necessarily an optimal conductivity for a pigment-based ink. Therefore, the Examiner's reliance on Nigan et al. to support his obviousness rejection is inapposite.

Nigan et al. does state that "the colouring agent is preferably a dyestuff soluble in the liquid vehicle; however, very finely divided ***pigments could be contemplated***." (column 3, lines 35-37) (emphasis added). Nevertheless, in *In re Lilly & Co.*, 14 USPQ2d 1741, 1743 (Fed. Cir. 1990), the court stated the following:

> An "obvious-to-try" situation exists when a general disclosure may pique the scientist's curiosity, such that further investigation might be done as a result of the disclosure, but the disclosure itself does not contain a sufficient teaching of how to obtain the desired result, or that the claimed result would be obtained if certain directions were pursued. *See generally In re O'Farrell*, 853 F.2d 894, 903, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988) (defining obvious-to-try as when prior art gives "only general guidance as to the particular form of the claimed invention or how to achieve it").

Likewise, the contemplation mentioned in Nigam et al., i.e., substitution of a pigment for a dye, merely presents an "obvious-to-try situation" which does not render any of the present claims obvious.

The Examiner also rejected claims 1-10, 13-14, 17-18, and 20 under 35 USC §103(a) over Noguchi et al. (US 5,658,376) in view of either Anton et al. (US 6,005,023) or Ma et al. (US 5,085,698), Tsutsumi et al. (US 5,852,074), Sano et al. (US 5,324,349), and either Lin et al. (US 5,531,818) or Nigam et al. (US 5,693,127). The Examiner states that "[t]he difference between Noguchi et al. and the present claimed invention is the requirement in the claims of ... (b) amount of anti-foaming agent ... and (d) conductivity of the ink." (Office Action dated December 8, 2000, page 4, 3rd paragraph).

Once again, the Examiner relies upon Tsutsumi et al. for its teaching of the amount of anti-foaming agent, and upon Linn et al. or Nigam et al. for its teaching of the conductivity of the ink. However, for the reasons given above, Tsutsumi et al., Linn et al., and Nigam et al. do not support the Examiner's obviousness rejections.

Accordingly, in the absence of additional prior art of increased pertinency, it is clear that the present invention as defined in the claims is indeed patentable and notice to that effect is respectfully requested.

The undersigned attorney and Richard M. Beck remain available to discuss this application and response with the Examiner by way of a telephonic or personal interview.

Respectfully submitted,

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Marked-Up Copy of Claims with Changes

1. An ink comprising about 30-90% ethanol-water vehicle, about 2-20% dispersant resin solublized by ammonium hydroxide, a component selected from about 2-9% translucent acrylate emulsion or about 2-5% hyperdispersant, about 1-12% pigment and 0.5-5% defoamer, wherein the ink has a conductivity from about 2800-9800 µS/cm.

13. (Twice Amended) An ink having a conductivity from about 2800-9800 µS/cm, a particle size of about 128-450 nm, and showing an increase of about 10-15 nm from the dry pigment particles and an equilibrium surface tension of about 25-42 mN/m, wherein the ink comprises about 1-12% pigment and about 2-20% dispersant resin solublized by ammonium hydroxide.

14. (Once Amended) The ink according to claim 13 comprising [about 2-20% dispersant resin solublized by ammonium hydroxide, about 1-12% pigment and] about 30-90% water-EtOH vehicle.

Clean Copy of Claims

1. An ink comprising about 30-90% ethanol-water vehicle, about 2-20% dispersant resin solublized by ammonium hydroxide, a component selected from about 2-9% translucent acrylate emulsion or about 2-5% hyperdispersant, about 1-12% pigment and 0.5-5% defoamer, wherein the ink has a conductivity from about 2800-9800 μS/cm.

2. The ink according to claim 1, wherein the dispersant resin is a styrene acrylate copolymer.

3. The ink according to claim 1, wherein the pigment is carbon black powder.

4. The ink according to claim 1, wherein the translucent acrylate emulsion contains 40-50% polymer.

5. The ink according to claim 1 further comprising a surfactant, a biocide, additional hyperdispersant or a humectant.

6. The ink according to claim 1, having a pH from about 7.2 to about 7.85.

7. The ink according to claim 1, having a viscosity from about 2.5 to about 2.8 centipoise.

9. The ink according to claim 1, having a particle size of about 128-450 nm, and showing an increase of about 10-15 nm from the dry pigment particles.

10. The ink according to claim 1, having a an equilibrium surface tension of about 25-42 mN/m.

Clean Copy of Claims (cont.)

11. The ink according to claim 1, comprising about 50-60% ethanol-water vehicle, about 8-9% dispersant resin solublized by ammonium hydroxide, about 5% translucent acrylate emulsion or about 3-3.5% hyperdispersant, about 5-9% pigment and about 0.8-1.1% defoamer.

12. The ink according to claim 11 further comprising about 1.5-2% humectant, an additional about 1-1.5% hyperdispersant, about 0.1-2.5% surfactant or about 0.3-0.4% biocide.

13. An ink having a conductivity from about 2800-9800 μS/cm, a particle size of about 128-450 nm, and showing an increase of about 10-15 nm from the dry pigment particles and an equilibrium surface tension of about 25-42 mN/m, wherein the ink comprises about 1-12% pigment and about 2-20% dispersant resin solublized by ammonium hydroxide.

14. The ink according to claim 13 comprising about 30-90% water-EtOH vehicle.

15. The ink according to claim 13 wherein the conductivity is about 5500-6000 μS/cm, the particle size is about 280-300 nm, the equilibrium surface tension is about 36 mN/m, and comprising about 8-9% dispersant resin solublized by ammonium hydroxide.

16. The ink according to claim 15 further comprising about 5-9% pigment and water-EtOH vehicle.

17. The ink according to claim 16, wherein the dispersant resin is a styrene acryate copolymer, the pigment is carbon black powder, the pH is about 7.2-7.85, the viscosity is about 2.5-2.8, and further comprising 2-9% translucent acrylate emulsion containing about 40-50% polymer, and an optional ingredient selected from surfactant, biocide, hyperdispersant or humectant.

18. A method of printing comprising the steps of (a) applying to a substrate an ink-jet ink comprising ethanol-water vehicle and about 2-20% dispersant resin solublized by ammonium hydroxide, about 2-9% translucent acrylate emulsion or about 2-5% hyperdispersant, about 1-12% pigment and about 0.5-5% defoamer; and (b) volatilizing the ammonia to fix the ink to the substrate.

19. The method according to claim 18, wherein the ink comprises ethanol-water vehicle and about 8-9% dispersant resin solublized by ammonium hydroxide, about 5% translucent acrylate emulsion or about 3-3.5% hyperdispersant, about 5-9% pigment and about 0.8-1.1% defoamer.

20. The method according to claim 18, wherein the ink has a conductivity from about 2800-9800 μS/cm, a particle size of about 128-450 nm, and showing an increase of about 10-15 nm from the dry pigment particles and an equilibrium surface tension of about 25-42 mN/m.

Clean Copy of Claims (cont.)

21. The method according to claim 18, wherein the ink has a conductivity from about 5550-6000 μS/cm, a particle size of about 280-300 nm, and showing an increase of about 10-15 nm from the dry pigment particles and an equilibrium surface tension of about 36 mN/m.